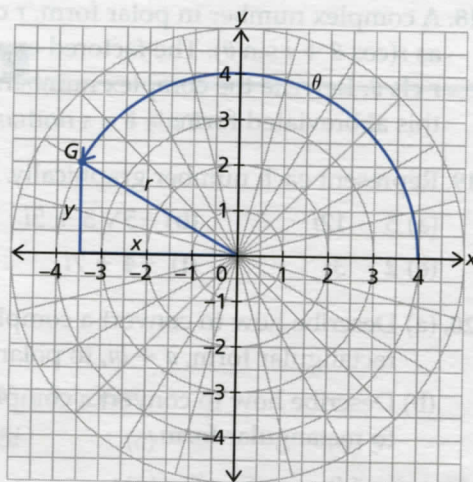


- H. Graph point $G(4, 150^\circ)$ on a polar coordinate grid. Recall, from your study of trigonometry, that $x = r \cos \theta$ and $y = r \sin \theta$. Use these relations to determine the rectangular coordinates of point G.



Summarize the steps to determine the rectangular coordinates of a point, given its polar coordinates.

- I. Graph the position vector representing $-9 + 5i$ on an Argand diagram.
- J. What is the length of the vector in Step I? How do you know? How can you find the length of the position vector representing any complex number, $a + bi$, in terms of a and b ?
- K. What is the angle measure between the positive real, or horizontal, axis and the vector in Step I? How do you know? How can you find the angle measure between the positive horizontal axis and the position vector representing any complex number, $a + bi$?

Summarize the steps to determine the polar coordinates of a point, given its rectangular coordinates.

Investigation Questions

14. Convert each set of rectangular coordinates to polar coordinates.
- (a) $P(5, 12)$ (b) $Q(-8, -15)$
 (c) $R(5, -7)$ (d) $S(-6, 3)$
15. Convert each set of polar coordinates to rectangular coordinates.
- (a) $T(7, 135^\circ)$ (b) $V(-5, 300^\circ)$
 (c) $U\left(4, \frac{4\pi}{3}\right)$ (d) $W\left(2, -\frac{11\pi}{6}\right)$
16. Explain why there are many different possible coordinates for the same point when expressed in **polar form**, yet only one set of coordinates for the point when expressed in rectangular form.
17. Convert each complex number in polar form to a complex number expressed in rectangular form, $a + bi$.
- (a) $5 \cos 120^\circ + (5 \sin 120^\circ)i$, or $5 \cos 120^\circ + 5i \sin 120^\circ$
 (b) $3 \cos 225^\circ + (3 \sin 225^\circ)i$, or $3 \cos 225^\circ + 3i \sin 225^\circ$
 (c) $6 \cos \pi + (6 \sin \pi)i$, or $6 \cos \pi + 6i \sin \pi$

-Note-

For rectangular coordinates (x, y) on a Cartesian coordinate system, the following relationships exist:
 $x = r \cos \theta$
 $y = r \sin \theta$
 For rectangular coordinates (a, b) on an Argand diagram, the relationships are
 $a = r \cos \theta$ and
 $b = r \sin \theta$.

polar form of a complex number—
 any complex number, $a + bi$, written in the form $r(\cos \theta + i \sin \theta)$